

Educational, didactic, and entertaining IFOP stand at Valdivia Nautical Fair 10

IFOP Director presents at a seminar "The new protection of marine biodiversity agreement on high seas and seabed: Chile and the South Pacific's Perspectives"

IT WAS ORGANIZED BY THE SCHOOL OF LAW OF THE PONTIFICIA UNIVERSIDAD CATOLICA DE VALPARAÍSO

On Monday, November 13th, in Valparaíso, "The new protection of marine biodiversity agreement on high seas and seabed: Chile and the South Pacific's Perspectives" seminar was held.

The Republic General Comptroller, Jorge Bermúdez, participated; Fisheries Development Institute Executive Director and PUCV International Law professor, Gonzalo Pereira; Federation of Fishing Industries of the South Austral FG General Manager, Valeria Carvajal; CA Juan Guajardo Chilean

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In his presentation, Gonzalo Pereira spoke about seabed beyond jurisdictional waters biodi-





versity protection new international agreement and its compatibility with high seas fishing international legal regime.

There are other instruments that address other matters, but there was no instrument that will regulate seabed biodiversity protection, so to address this new international text, this seminar was organized in two segments, one presenting negotiation, agreement's content and compatibility with international regulations. The second segment was a debate between three sectors involved in fishing activity, and linked to the sea, NGOs representatives, an Undersecretary of Fisheries advisor and a industrial sector representative. It was a seminar in which it was possible to learn about this agreement's content and the impacts it may have for Chile from three sectors perspective, which are different but linked.

It had the participation of university students, professionals from the Fisheries Development Institute and Fisheries Undersecretariat.

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With a broad call, a Climatic Change webinar was organized by Fisheries Network and Pacific Alliance Aquaculture Research Institutions (IIPA-AP Network) was held

On Friday, November 10th, Climatic Change: vulnerability and possible effects on fishing and aquaculture" webinar was held, an event that brought together more than 100 participants from different countries that participate in the IIPA-AP Network, including Chile, Peru, Colombia, Mexico and Argentina.

There were presentations by Dr. Jaime Letelier from Fisheries Development Institute (IFOP), Chile; Dr. Adolfo Chamorro from Peruvian Sea Institute (IMARPE), Dr. Micaela Giorgini from Fisheries Research and Development Institute (INIDEP), Argentina; and Dr. Doris Soto from Interdisciplinary Center for Aquaculture Research (INCAR), Chile.

In their presentations, the experts presented information on current and future oceanographic conditions on the national coasts, including environmental variability influence on biodiversity sustainability and fishing and aquaculture activities. The importance of research and monitoring was also emphasized; education and awareness; the need for collaboration between different institutions and countries; and the generation of public policies based on scientific information. All this to advance towards the adaptation of fishing and aquaculture sector to Climatic Change.

This webinar, organized by the IFOP, is one of the activities contained in the 2023-2024 IIPA-AP Network Work Plan. Through these types of instances, we seek to generate spaces for rapprochement and discussion between research institutions that make up the Network, as well as with other actors associated with the fishing and aquaculture sector in the region. On this occasion, profes-





sionals from Chile's Undersecretariat of Fisheries and Aquaculture were present; Colombia Productiva, an entity belonging to Colombia's Ministry of Commerce, Industry and Tourism; Fisheries and Aquaculture Technical Groups representatives, and Pacific Alliance Environment and Green Growth; Venezuela Fisheries and Aquaculture National Scientific Research Center, among others.

IFOP held a course on "Biology and ecology of cephalopods"

On November 15th and 16th, at IFOP San Antonio headquarters. "Cephalopods Biology and ecology" course was held. Scientific observers from Coquimbo, San Antonio, Maule, Lebu, Coliumo and Talcahuano participated.

The course aim was to review latest biological cephalopods related research, with emphasis on Dosidicus gigas species. Also emphasizing topics such as reproduction, age and growth, distribution and habitat.

In addition, the workshop had a practical part where attendees could see various species of octopuses and cephalopods specimens. Obser-



vers were able to identify taxonomic keys, stages of statoliths maturity and extraction.

Cuttlefish or Humboldt squid is endemic to the Pacific Ocean eastern region and is found from Alaska to Aysen Region in our country. It is a large voracious and opportunistic predator, feeding on fish such as common hake, horse mackerel, lantern fish, some crustaceans, other squid, in addition to practicing cannibalism.

Karen Belmar, Head of cuttlefish fishery in Coquimbo, Valparaíso, Ñuble and Biobío regions and Cuttlefish in Chile IFOP-GEF Biological Study Program Head

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Monitoring Head explained "this course has great relevance for knowledge updating both for observers and researchers who work with such an important resource in our country and it presents us with a great challenge, which is in line with increasing and improving biological information on cuttlefish in Chile."

The workshop was given by Christian Ibáñez, Doctor of Science with a major in ecology and evolutionary biology, currently a professor at Universidad Andrés Bello. Ibáñez has extensive experience working with cephalopods and currently his line of research is focused on marine animals' ecology and evolution with marine invertebrates' s special attention.

IFOP Participates in "Chilean Wildlife Day"'s first version in Magallanes region

"Chilean Wildlife Day" is an initiative that has been developed by Jane Goodall Institute Chile Foundation (JGI) for nine consecutive years, in Santiago. It aims to raise awareness among citizens about natural heritage, particularly about native fauna. This year 2023, within this event tenth anniversary framework, we sought to expand the celebration to other geographical areas of Chile and the first milestone was marked by Magallanes region.

On Saturday, November 4th, 2023 between 10:00 and 18:00, in Southern Zone of Punta Arenas Central Module premises, the regional fauna was celebrated with a free event aimed at children, young people, adults and families; where civil society organizations, citizen groups, research institutions and public services were involved in enhancement, research and conservation of wildlife had spaces to engage with citizens.

Wildlife Conservation Society Chile (WCS), with whom IFOP has had a Collaboration Agreement in the region since 2018, organized



this event and invited IFOP to focus its participation on two Strategic Research Programs for Magallanes: "Monitoring crab and king crab crustaceans" and "Red tides Management and Monitoring in the chilean fjord and channel system"

Crab fishery is of Magallanes artisanal fishing sector great importance, however, not all the community knows how it is extracted, where its main extraction areas are located, what the current management measures are and what type of research is carried out in the region. Manuel Lemus, a historic fisherman of this resource, donated to IFOP a male crab of commercial size (greater than 12 cm in length of the cephalothorax), which was kept in an aquarium, where a large number of children and their families were able to observe it and talk to it. IFOP professionals about the research currently being carried out by the Institute to conserve this species and promote sustainable fishing.

On the other hand, faced with region's northern part shellfish extraction areas closure. IFOP showed the permanent monitoring it carries out on harmful algal blooms (HABs), indicating places where monitoring stations are located, type of oceanographic information that is collected, vectors extraction and water samples for quantitative and qualitative analysis of harmful phytoplankton. Attendees had the opportunity to interactively observe

dinoflagellate Alexandrrium catenella identified as the primary source of Paralyzing Shellfish Poison (PMV),



as well as learn from IFOP specialists in this matter, the current regulations along with the safety measures. self-care that should be kept in mind.

In this IFOP's public role dissemination instance, Scientific Observers actively participated: Gino Liche, Moisés Opazo, José Luis Díaz, Field Coordinators: Alejandra Valdebenito, Jacqueline Parada, Laboratory Analyst César Alarcón, Researcher Cristian Vargas together with Erik Daza Headquarters Head.

Extraordinary IFOP Stand at Puerto Montt Science Festival in

CREAN – IFOP working group participated in the Science Festival, organized by PAR – Explora Los Lagos, between November 15th – 16th, 2023, at Puerto Montt's Arena events center, through different activities focused on publicizing phytoplankton main species and discussing Harmful Algal Blooms in Chile, or commonly known as "red tides."

In this way, a photographic sample of microalgae was made, which were captured by Los Lagos region phytoplankton group professional lens (Julia Cáceres, Loreto López, Bianca Olivares and Karen Correa), Aysén (Verónica Muñoz), and Magellan (Pablo Salgado). These photographs were exhibited in a montage made by Rodrigo Martínez, a researcher at the Puerto Montt center. Thus, those who participated in this activity were able to learn about phytoplankton diversity of shapes and sizes, in addition to their system important characteristics and functions. On the other hand, the work was complemented with practical activities through an inverted microscope, impressing attendees with the diversity of species found in just a drop of seawater, and the "magical power" of microscopy.



Pamela Carbonell, this activity responsible researcher, who closed the second day of FECI 2023, through a talk about FAN in Chile, pointed out that the Science Festival is an important dissemination and education activity in the region, which allows us to bring this world, sometimes little known, closer to a diverse group of participants, who are enchanted by these small organisms with such important characteristics for marine ecosystems.



IFOP's Researcher Jaiber Solano, attends VI biennial Wildlife Disease Association Conference

MADE IN ANTIGUA CITY, GUATEMALA

Between November 13th and 17th, WDA (Wildlife Disease Association)VI biennial Conference, Latin America section, took place in Antigua city Guatemala. The event seeks to disseminate wildlife's diseases research, in relation to their biology, conservation and interaction with other system components. In this way, it is an important opportunity to generate cooperation networks in this area.

Scientist Jaiber Solano participated from IFOP, explaining "in this event, I presented a poster, associated with my ANID postdoctoral research, in collaboration with researchers from Florida University, Universidad Austral de Chile and Universidad Andrés Bello. The work I presented aims to investigate host's evolutionary history effect, pathogenic fungus Batrachochytrium dendrobatidis (Bd) presence, environmental factors and deterministic and neutral processes interaction on bacteria diversity associated with 22 frog species skin in Chile".



Abate Molina Scientific vessel set sail to investigate anchovy in Arica and Antofagasta regions

THE CRUISE WILL LAST 30 DAYS, AND IS LED BY FISHING ENGINEER FRANCISCO LEIVA, AS CAPTAIN OF THE SHIP IS TAKASHI ABBE

On the night of November 22nd, scientific vessel Abate Molina set sail from Valparaíso's Port to carry out a hydroacoustic survey between Arica, Parinacota and Antofagasta Regions to evaluate anchovy stock present in the study area.

This cruise specific objectives are

- Carry out 41 acoustic transects between Arica and the Paposo roadstead
- Evaluate shore bias (between 18 30° and 22° LS) with an artisanal boat.
- Carry out a sufficient number of reconnaissance fishing hauls to characterize anchovy stock
- Build oceanographic stations in the study área



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Dr. Luis Henríquez-Antipa, from IFOP, speaks at 5th Modern Extensive Aquaculture International Academic Conference, Organized by the Chinese Fisheries Society

Within the framework of the 5th International Modern Marine (Freshwater) Ranching Academic conference, organized by The Chinese Fisheries Society and held between November 16th and 17th in Guangzhou, China.

Dr. Luis Henríquez-Antipa, Fisheries Development Institute (IFOP) Repopulation and Cultivation (RyC) Department senior researcher, was invited to give the keynote talk: "Current status of stock improvement and extensive aquaculture in Chile, recent advances toward sustainable growth".

During his talk, Dr. Henríquez-Antipa made an official invitation to participate in the 7th Stock Enhancement and Sea Ranching International Symposium – ISSESR7 Chile (International Symposium on Stock Improvement and Extensive Aquaculture), which will be held for the first time in Latin America, during November 2024, with Aquaculture Research Stocking and Culture Division Department, as its host.

According to Dr. Henríquez-Antipa: "Both the 5th International Symposium on Modern Extensive Aquaculture and ISSESR constitute two of the most important international symposia in the sciences of stocking, stock improvement, and extensive aquaculture in the world. The IS-SESR symposium series hosts a select group of researchers, mainly from Northern Hemisphere and Asia, who have developed significant advances in stock improvement, aquaculture-assisted repopulation, habitat restoration, genetic management, animal ethology, legislation and social -coastal ecology within an ecosystem approach. This will be a great opportunity to assimilate international developments in stock improvement and habitat restoration urgent matter at the country level and will also allow Chilean and Latin American researchers to share their research and results in this discipline."



Methodological discussion workshop "Employment estimation on small scale aquaculture sector was organized by IFOP

This Monday, November 22nd, at Valparaíso's IFOP Auditorium, the first Methodological Discussion Workshop for estimating employment in Small Scale Aquaculture (APE) sector took place. This activity is part of No. 8 specific objective fulfillment of Fishing and Aquaculture Industry 2023-2024 Economic Monitoring project. The Economics Section, dependent on IFOP's Fisheries Evaluation Department, assumed this task's execution, which is led by Luis Carroza, with Juan Carlos Saavedra and Hernán Miranda statistical support both of them IFOP Fisheries Division professionals.

The workshop was carried out in a hybrid format, with the participation of professionals from IFOP's Economics Section and Aquaculture Division, Fisheries and Aquaculture Undersecretariat division (SUBPESCA) Sectorial Analysis Department and



Aquaculture Division, as well as National Fisheries and Aquaculture Service (SERNAPESCA). During the session, small-scale aquaculture sector characterization was presented and various studies related to aquaculture employment's estimation were reviewed. All these elements will be integrated into methodology design to determinate small-scale aquaculture employment. Subsequently, sampling plan related aspects were proposed, whose objective will be to collect employment information from primary sources.

As part of the conclusion, a roadmap first version was shared with the activities that will be carried out between December 2023 and July 2024. The importance of coordination and information exchange between IFOP's Economics Section was highlighted, SUBPESCA, and SERNAPESCA, were key factors in order to project positive results in this objective achievement.

Leonardo Guzmán Méndez Recognition by IFOP's Professionals and Technicians Union

On November 22nd, 2023. IFOP Professionals and Technicians union met to recognize Dr. Leonardo Guzmán Méndez work, former IFOP's Aquaculture Division head, who has worked at the institution for 31 years both as a researcher, Punta Arenas zonal head (for a time between Valdivia and Punta Arenas), and Puerto Montt Aquaculture Research Division's Head.

Doing a brief review of Leonardo's academic and work life, we can say that he was born in Punta Are-

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nas, his father being Feliz Guzmán and his mother Inés Méndez and from there he moved to Santiago to study at tUniversidad de Chile, where he obtained a bachelor's degree. in marine biology in 1969. After that, in 1997 he completed his doctorate in Sciences with a mention in zoology at Universidad de Concepción. He worked at Patagonia Institute for 20 years and as a Universidad de Magallanes's associate professor for 12, where he dedicated himself to researching species of commercial importance and the response of natural systems to anthropogenic disturbances and harmful algal blooms, being his main interest in environmental sciences and the anthropic impact on aquatic systems.

After working in southern Chile, in Punta Arenas, he went to work at Fisheries Development Institute of the same city in 1992, as zonal head at that time. In 2003 he took on the challenge of moving to Puerto Montt to direct the Aquaculture Research Division until 2023, where he left the leadership position to continue as project manager of the Red Tide program.

There is no doubt about Dr. Leonardo Guzmán's contribution to science regarding harmful algal blooms; his contribution to the emergence of "New" IFOP's Aquaculture Research Division must also be recognized, in complex times. It was a transition period for the Division, where it went from promoting aquaculture to generating public role research, strengthening the Institution in the framework of advising decision makers.

For his great professionalism and for having worked for the benefit of those of us who make up the Aquaculture Division, the IFOP Professionals and Technicians Union appreciates his management,

recognizing his work in these years and especially in these last 21 as head of Division.



Participation of IFOP researchers, Carolina Rösner and Rodrigo Vera in the Second Congress of Ecohydrology

Between November 15th and 17th, the Second Ecohydrology Congress was held at Universidad Diego Portales in Santiago. The activity brought together experts to address current challenges in water management and environmental sustainability in the country. Researchers Carolina Rosner and Rodrigo Vera participated from IFOP.

IFOP presentations



Mcs. Carolina Rösner had the title "Macrophytes as bioindicators within Lake Llanquihue's Secondary Environmental Quality Standards framework". Macrophytes are considered good environmental quality indicators of a lake system, helping to identify trophy and quality degree of waters that surround them, since they are sensitive to changes in physical-chemical quality. Therefore, macrophyte communities characteristics present in a certain place reflect existing quality conditions during the last months or even years, which could be the disappearance or appearance of a species, or changes in its relative abundance, which is highly significant information.

In this context, a study was carried out on macrophytes in Lake Llanquihue, second largest lake in Chile, and which since 2009 has had a Secondary Environmental Quality Standard, whose objective is to establish limits for the lake's eutrophication levels. This standard also considers biological indicators use in a complementary manner to water quality control, including macrophyte communities abundance and composition in the four surveillance areas (Puerto Varas, Frutillar, Puerto Octay and Ensenada).

In this study, the presence of a total of 36 macrophyte species and one macroalgae was recorded. To determine the lake's trophy levels, two methods based on macrophytes were used, San Martín method et al. 2003 and ITFM index (Urrutia et al. 2015), which yielded similar results. When comparing the trophy based on coverage, it was obtained that in general stations presented a low to medium trophy. As species tolerant to eutrophication, the following were identified: Cyperus xanthostachyus, Hydrocotyle ranunculoides, Impatiens glandulifera, Nasturtium officinale, Polygonum persicaria, Raphanus sativus, Sonchus oleraceus, and Trifolium pratense. Of them, only C. xanthostachyus is native.

Meanwhile, the indicator species of oligotrophy were: Equisetum bogotense, Isolepis cernua, Nitella aff. acuminata, Rumex acetosella, and Trifolium campestre, of which the last two are introduced. The rest of the species were considered indifferent regarding eutrophication. Abundance patterns indicating serious eutrophication impacts, such as excessive increase in marsh macrophytes or single tolerant species dominance, were absent. This may be associated with the lake's conditions ,as well as with the methodology used for submerged macrophytes research, suggesting that future study areas location should be directed to areas with discharges from point sources, where a relationship is found between abundance of this species and nutrient concentrations.

On the other hand, Dr. Rodrigo Vera S. researcher presented at the congress his work entitled "Physico-chemical variables in Lake Llanquihue between 1986 and 2019, do the origin, time and place from where the data are obtained influence?" where data was obtained from DGA and IFOP between 1986 and 2019 from water column of: total phosphorus con-

centration, total nitrogen, phosphate, nitrate, nitrite, silicates, dissolved oxygen, chlorophyll-a and Sec-





chi disk depth and were analyzed according to their origin, time, year and season (sampling point) in which samples were taken. For this, Permanova (Adonis2), NMDS and EnvFit (R-program) analyzes were carried out on collected data base, after values standardization and normalization. Water quality data from Lake Llanquihue from other institutions or research programs were discarded in this analysis because anomalous values were generally detected (detection limits that were too high, sum of nitrogen and phosphorus components higher than the totals, and values statistically anomalous, among others).

The results show significant differences between the 2 origins (DGA and IFOP, p < 0.001), while the time of sampling seems to make a difference in values obtained (winter-spring differs from summer-autumn, p < 0.001). Analysis over time (p<0.002) indicated that there were differences between the sampling years but that there were also similarities (post hoc pairwise.test). Finally, stations or sampling points in Lake Llanguihue do not differ from each other. NMDs clearly showed separate groups according to samples origin just as winter-spring samples were grouped together and differentiated from the summerautumn samples. EnvFit indicated that silicates concentration in water and total nitrogen concentration made NMDs groupings possible and in third place was oxygen concentration in the water column. It is concluded that the difference in collected data is mainly related to data's origin (DGA or IFOP) and not necessarily to different sampling points within Lake Llanguihue. For future time series analysis, sampling with greater periodicity is necessary and due to low nutrient concentrations that an oligotrophic lake like Llanguihue has, it is necessary that laboratory analysis has the required detection limits and precision.

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Educational, didactic, and entertaining IFOP stand at Valdivia Nautical Fair

THROUGH SOME AQUACULTURE DIVISION RE-SEARCH GROUPS, FISHERIES DEVELOPMENT INSTITUTE, MADE KNOWN TO THE COMMU-NITY, THE EXTENSIVE WORK IT CARRIES OUT IN VARIOUS AREAS SUCH AS: REPOPULATION AND CULTIVATION, MYTILIDS RESEARCH THROUGH ITS "ENDEMIC SEED" TOOL, OCEA-NOGRAPHIC STUDIES THROUGH ITS "CHO-NOS" TOOL, AND INFORMATION DELIVERY ON HARMFUL ALGAE BLOOMS WITH ITS MONI-TORING PROGRAMS, BOTH IN THE FJORD AND CHANNEL AREAS, AND ON THE PACIFIC COAST.

Between November 24th and 26th, Valdivia Nautical Fair's second version was held in Saval Park of this city. This event seeks to promote nautical industry through strategic intersection between design and boats construction, tourism, sports, technology and companies linked to southern Chile productive development, bringing together hundreds of people every day, who enjoyed the stands and various talks held. Thus, Fisheries Development Institute was invited to participate in this second Náutica Valdivia version, to show public in Los Ríos region and surrounding the important work it carries out in various aquaculture areas.

The stand was attended by Francisco Cárcamo, Repopulation and Cultivation Department head, who also gave the talk "Contributing to development and sustainability of fishing and aquaculture in Chile", presenting main's institutional task, across all departments nationwide. The Mytilid group was represented by Cristian Segura, Cristina Stuardo and José Videla, who captivated children and general public with a saltwater aquarium, explaining through it the main benthic resources, their biological processes, and their "Endemic Seed" tool, which allows for timely information on the variability in the availability of larvae and mytilids for seed collection. Putemún working group was represented by Carolina Medel, who explained to the public the main oceanographic processes,

sampling systems, and the "Chonos" tool, which works with an oceanographic information system, whose products



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and applications are result of environmental studies that, through numerical modeling, seek to improve territory's management and planning. Finally, red tide group was represented by Rodrigo Martínez and Pamela Carbonell, who showed microalgae various species, talking about their importance in marine ecosystem, and the impact that some harmful species have through production. of toxins related to public health, due to the decrease in oxygen available in water column, or due to mechanical damage that some species produce, thanks to their external structures, in addition to publicizing the monitoring that is carried out in more than 300 stations between the Biobío region to the Magallanes region.

Without a doubt, IFOP's participation in "Náutica Valdivia" fair made it possible to publicize various research areas carried out by the Institute throughout the country, in addition to existing tools that each work group has been developing, to contribute to knowledge that allows decision-making in the face of environmental and health contingencies, as well as marveling general public with the diversity of marine life, and understanding how processes are related to each other.



